



Minnesota State University, Mankato
**Cornerstone: A Collection of Scholarly
and Creative Works for Minnesota
State University, Mankato**

All Graduate Theses, Dissertations, and Other
Capstone Projects

Graduate Theses, Dissertations, and Other
Capstone Projects

2014

Physical Environment and Women's Physical Activity Behaviors

Beth Ann Brisky
Minnesota State University - Mankato

Follow this and additional works at: <https://cornerstone.lib.mnsu.edu/etds>

Digital part of the [Community Health and Preventive Medicine Commons](#), and the [Public Health Education Commons](#) and [Information Commons Network](#)

Logo Recommended Citation

Brisky, B. A. (2014). Physical Environment and Women's Physical Activity Behaviors [Master's thesis, Minnesota State University, Mankato]. Cornerstone: A Collection of Scholarly and Creative Works for Minnesota State University, Mankato. <https://cornerstone.lib.mnsu.edu/etds/292/>

This Thesis is brought to you for free and open access by the Graduate Theses, Dissertations, and Other Capstone Projects at Cornerstone: A Collection of Scholarly and Creative Works for Minnesota State University, Mankato. It has been accepted for inclusion in All Graduate Theses, Dissertations, and Other Capstone Projects by an authorized administrator of Cornerstone: A Collection of Scholarly and Creative Works for Minnesota State University, Mankato.

PHYSICAL ENVIRONMENT AND WOMEN'S PHYSICAL ACTIVITY BEHAVIORS

By

Beth Ann Brisky

A Thesis Submitted in Partial Fulfillment of the

Requirements for the Degree of

Masters of Science

In

Community Health Education

Minnesota State University, Mankato

Mankato, Minnesota

May 2014

Physical Environment and Women's Physical Activity Behaviors

Beth Ann Brisky

This thesis has been examined and approved by the following members of the student's committee.

Dr. Marlene K. Tappe, Chairperson

Dr. Mark Windschitl, Committee Member

Dr. Joseph D. Visker, Committee Member

Acknowledgments

To my parents, thank you for the support you have always given me and motivation to continue to strive for my goals.

To my friends/classmates, you have made this journey so much easier by having you all by my side.

To Dr. Marlene Tappe, thank you for the time you have dedicated to me as my chairperson of my thesis and as my advisor. I appreciate the help and guidance you have given me to complete this paper.

To Dr. Mark Windschitl, thank you for the support and time you have dedicated to me as a committee member.

To Dr. Joseph Visker, thank you for the time you have dedicated as a committee member and in Seminar. Your support and guidance was greatly appreciated.

To Dr. Judith Luebke, thank you for the education you have provided us throughout the program. I also want to express my gratitude for your willingness to read and re-read my thesis to make sure I was on the right track in Techniques of Research.

Abstract

Physical Environment and Women's Physical Activity Behaviors

Beth Ann Brisky, M.S. Minnesota State University, Mankato, 2014

This study was developed using the Ecological Model (Stokols, 1992). The purpose of this study was to determine women's perceptions of the physical environment and the relationship between perceptions and physical activity behaviors. The study also analyzed women's non-motorized transportation behaviors, including walking and cycling to get from place to place. An email was sent to 526 female Minnesota State University, Mankato employees to ask them to participate in an electronic survey. The survey was developed using two of Sallis's (2013a, 2013b) instruments, Neighborhood Quality of Life Study survey and Neighborhood Environment Walkability Scale-Confirmatory Factor Analysis survey. The survey consisted of 51 questions addressing general information, perceptions of the physical environment, and physical activity behaviors. There were a total of 200 responses; however, 23 were eliminated as a result of unverified age or incomplete surveys. The data was analyzed with 177 completed surveys.

The participants' had positive perceptions regarding the safety and aesthetics of their perceptions of their physical activity environments. Their perceptions regarding the accessibility and convenience of the environments, however, were not favorable. Very few relationships were found between the women's perceptions of the physical environment and physical activity behaviors. About half of the women reported that they

walked as a mode of transportation. A small proportion of women reported that they cycled as a mode of transportation.

Future research recommendations include conducting this study during warmer weather months to identify how their perceptions of their physical activity environments and their physical activity behaviors are associated when the weather is more suitable for physical activity.

Table of Contents

Chapter One: Statement of the Problem.....	1
Statement of the Problem.....	2
Significance of the Problem.....	2
Research Questions.....	4
Limitations.....	4
Delimitations.....	5
Assumptions.....	5
Definition of Terms.....	5
Summary.....	6
Chapter Two: Literature Review.....	7
Physical Activity Among Women.....	7
Physical Environment and Physical Activity.....	8
Ecological Model to Identify Environmental Determinants of Physical Activity.....	9
Summary.....	13
Chapter Three: Methodology.....	14
Research Design.....	15
Participants.....	15
Instrumentation.....	16
Procedure.....	18
Data Collection.....	18

Data Processing.....	19
Data Analysis.....	19
Summary.....	20
Chapter Four: Results and Discussion.....	21
Demographic Characteristics of Participants.....	21
Cronbach's Index of Internal Consistency	
(α) for Sallis's Perceptions of the Physical Environment Scale.....	23
What are Women's Perception of the Physical Environment?.....	24
How are Women's Perceptions of the Physical Environment	
Associated With Their Physical Activity Behaviors?.....	30
How much is Cycling and Walking Used as a Mode of Transportation?..	31
Summary.....	37
Chapter Five: Conclusions, Discussion, and Recommendations.....	38
Conclusions.....	38
Discussion.....	39
Recommendations for Health Educators.....	41
Recommendations for Further Studies.....	42
References.....	43
Appendixes.....	50
A. Survey.....	51
B. Online Consent Form.....	61
C. IRB approval.....	63

List of Tables

Table 1 Demographic Characteristics of the Sample.....	22
Table 2 Cronbach’s Index of Internal Consistency (α) for Sallis’s Perceptions of the Physical Environment Scale.....	24
Table 3 Perceptions of the Physical Environment.....	26
Table 4 Scale Descriptive Statistics for Perceptions of the Physical Environment...	30
Table 5 Pearson Correlation Coefficients (r) Between Women’s Perceptions and Their Physical Activity Behaviors.....	31
Table 6 Frequency of Transportation by Cycling and Walking.....	32
Table 7 Duration of Transportation by Cycling and Walking.....	34

List of Figures

Figure 1 Temperature Measured in ° Fahrenheit from..... 36
March 11, 2014 through March 24, 2014

Figure 2 Precipitation Measured in Inches from 37
March 11, 2014 through March 24, 2014

Chapter One: Statement of the Problem

The physical environment offers an array of opportunities for adult women to engage in physical activity. The physical environment, also referred to as the built environment, may include sidewalks, bike paths, and fitness trails (County Health Rankings & Roadmaps, 2013). Adult women may access the environment for leisure, exercise, or a method of transportation (Centers for Disease Control and Prevention [CDC], 2012b). The physical environment is accessible and inexpensive for most users to engage in physical activity.

Adults are recommended to engage in two and a half hours of aerobic activity per week (CDC, 2011a). In 2011, 45.6 percent of adult females, 18 years old and older, met aerobic physical activity guidelines (National Center for Health Statistics [NCHS], 2012b). When combining the recommended muscle-strengthening activities to the aerobic activity, adult females reported 17.2 percent to meeting both guidelines (NCHS, 2012b). The CDC adult physical activity recommendations include both aerobic and muscle strengthening activities (2011a).

Physical activity is recognized to aid in several health benefits to people who engage in physical activity on a regular basis. The health benefits of physical activity include heart health, bone health, weight control, mood, and overall longevity (CDC, 2011d). Physical activity also prevents obesity, heart disease, and diabetes (CDC, 2012a).

Although women may be aware of the health benefits from regular physical activity, they face several factors preventing them from engaging in activity. The CDC

(2011c) published a list of these factors including lack of resources, not enough time, lack of motivation and support, and lack of confidence to engage in physical activity. In comparison to lack of resources to afford a costly gym membership, the physical environment offers an inexpensive resource to engage in physical activity. The CDC currently funds 25 states to enhance communities “so people can more easily fit physical activity into their lives” (2013b, para. 7). Their goal is to provide accessible, convenient, and safe environments for physical activity to be an easier choice (CDC, 2013b).

Statement of the Problem

The physical environment is an accessible and inexpensive site for physical activity. However, there are specific factors influencing women's perceptions of the environment. These factors include: (a) accessibility and convenience, (b) aesthetics and, (c) safety of the environment (Sallis, Owen, & Fisher, 2008). Negative perceptions of the environment inhibit women's use of their physical environment (Paxton, Sharpe, Granner, & Hutto, 2005). The consequence of reduced use of the physical environment limits voluntary and involuntary physical activity behaviors. Active transport, such as walking or cycling to reach a desired destination, produces an unintentional increase in physical activity when people are using this as a mode of transportation. However, adults are not as likely to engage in active transport when convenience and safety are negatively perceived in the environment (CDC, 2012b).

Significance of the Problem

The NCHS (2012b) revealed that 17.2 percent of adult women met the recommended guidelines for physical activity for Americans. Individually, adult women

are meeting recommended guidelines for aerobic activity at 45.6 percent and muscle-strengthening at 20.2 percent (NCHS, 2012b). These percentages include an age range from 18 years old to 75 years old and older (NCHS, 2012b). The highest rate of met aerobic physical activity and muscle-strengthening activity is found at 18 years old, and the percentages steadily decrease as age increases (NCHS, 2012b).

Sedentary lifestyles can lead to an increase in weight and potential health risks. The higher amount of fat content in the body due to overweight can increase the rate of cardiovascular diseases and musculoskeletal disorders (World Health Organization [WHO], 2013a). From 1960-1962, 54.1 percent of adult women were meeting a healthy body mass index. By 2007-2010, this figure dropped to 33.6 percent of adult women meeting a healthy body mass index (NCHS, 2012a). This research does not address the factors for this decline over the years; however, it serves as a reminder of the importance of physical activity.

Minnesota communities are recognizing the need to design the physical environment to increase physical activity. One strategy is to improve the structure of the built environment to promote active transport which includes walking and cycling as the mode of transportation (City of Mankato, 2010).

The CDC (2013b) acknowledged a need to develop communities around the United States to provide residents with accessible, convenient, and safe environments. The improvements aim to encourage an increase in physical activity (CDC, 2013b). As a result, the CDC is currently funding 25 states to improve the physical environment with intentions to increase physical activity (CDC, 2013b). The physical environment

possesses the ability to increase physical activity when adult's perceptions of the environment are at ease (CDC, 2012b). However, when safety or accessibility concerns exist within the physical environment, adults are less likely to engage in physical activity in the environment (Paxton et al., 2005; Roman & Chalfin, 2008).

Research Questions

Four research questions were explored in this study. These questions included:

1. What are women's perceptions of their physical environment?
2. How are women's perceptions of the physical environment associated with their physical activity behaviors?
3. How much is cycling used as a mode of transportation by women?
4. How much is walking used as a mode of transportation by women?

Limitations

There were five limitations to this study. These limitations included:

1. the research used an electronic survey sent through official campus email,
2. the participants self-reported their physical activity behaviors,
3. the participants recalled their perceptions of the physical environment pertaining to their use or nonuse of the environment,
4. the sampling method used was convenience sampling,
5. the participants were asked about physical activity behaviors in the physical environment during winter months, and

6. the number of eligible participants who responded to the survey was insufficient in order for the results to be representative of female employees at Minnesota State University, Mankato.

Delimitations

There were parameters related to this research. These parameters included:

1. the research took place in Mankato, Minnesota,
2. the research took place in the winter months,
3. the participants were personnel from Minnesota State University, Mankato, and
4. participants were adult women eighteen years old and older.

Assumptions

There were two assumptions related to this research. These assumptions included:

1. participants answered survey questions honestly and accurately, and
2. participants answered surveys at their own convenience.

Definition of Terms

A series of operational definitions apply to this study. These operational definitions include:

Active transport. It is a mode of transportation that consists of walking or cycling to get to a desired destination.

Adult women. Females eighteen years old and older.

Aerobic physical activity. An activity that gets a person breathing harder and their heart beating faster. The activity can be moderate intensity, such as walking. It can also be vigorous intensity, which includes running (CDC, 2011b).

Physical activity. Physical activity was defined as aerobic physical activity.

Physical environment. Physical environment is also referred to as neighborhood environment or built environment.

Summary

The purpose of this research was to determine women's perceptions of their physical environment. Furthermore, the research verified the existence of any associations between women's perceptions of the environment and physical activity behaviors. The research also explored whether or not women are using physical activity as a mode of transportation. The review of literature related to this study is provided in the next chapter.

Chapter Two: Literature Review

The purpose of this research was to identify the perceptions of the environment influencing women's physical activity behaviors. The research also investigated whether an association existed between variables regarding use and non-use of the physical environment. The variables identified and explored were (a) accessibility and convenience, (b) aesthetics (c) active transport, (d) physical activity and, (e) safety. These variables were used to examine the influences on adult women's behaviors regarding active recreation and active transport domains of the ecological model. The literature review provides further insight on the physical environment, ecological model, perceived environment concepts as defined by the ecological model, active transport, and physical activity sustainability in communities using the physical environment.

Physical Activity Among Women

Adult women are recommended to complete two and a half hours of aerobic physical activity per week (CDC, 2011b). Aerobic physical activity is an activity women engage in to raise their respiratory rate and heart rate. These activities can include, but not limited to, walking, jogging, and running (CDC, 2011b). Walking is considered a moderate-intensity activity (CDC, 2011b). Over 145 million adults engage in walking for exercise, relaxation, or transportation (CDC, 2012b). A vigorous-intensity activity is defined as running (CDC, 2011b).

In terms of physical activity, there were differences found between men and women. Women were more likely to walk for exercise compared to men (Suminski, Carlos Poston, Petosa, Stevens, & Katzenmoyer, 2005). Suminski and associates (2005)

also reported when women felt safe in their neighborhood, they were more likely to engage in activity. Men were not impacted by environmental features, such as safety (Suminski et al., 2005). Men surpassed women in meeting the United States recommended physical activity guidelines (NCHS, 2012b).

Physical Environment and Physical Activity

The physical environment encompasses both synthesized and natural settings. It is also referred to as the neighborhood or built environment (CDC, 2013a). The built environment is the structure of sidewalks, trails, buildings, and spaces created by people (County Health Rankings & Roadmaps, 2013). Topography and weather define the natural settings of the physical environment. Weather is a variable that has mixed responses from participants in previous studies. For example, Bike Walk Twin Cities (2013) reported their lowest cycling numbers during the winter months. Some women have reported weather as a barrier, where others do not find it as bothersome (Hoebeke, 2008). Weather may have a greater influence on physical activity behaviors depending on the geographic location.

The physical environment provides a place for people to engage in physical activity. The purpose of women's physical activity in the physical environment includes exercise, enjoyment, relaxation, and transportation (CDC, 2012b). Physical activity as a mode of transportation continues to expand in communities. Communities have developed strategies to increase opportunities for people to engage in walking or cycling to get to their destinations (City of Mankato, 2010).

Ecological Model to Identify Environmental Determinants of Physical Activity

The ecological model is designed as a model to use for health promotion and interventions that interlaces human behavior and environments (Sallis et al., 2008). The model suggests effective interventions are the result of addressing “diverse environmental and personal factors rather than on analyses that focus exclusively on environmental, biological, or behavioral factors” (Stokols, 1992, p. 7). The ecological model consists of four domains of active living: active recreation, active transport, household activities and, occupational activities (Sallis et al., 2008). Although the ecological model is more complex, active recreation and active transport were the domains addressed in this research. The ecological model also includes concepts of the perceived environment including (a) accessibility and convenience, (b) aesthetics, (c) active transport, (d) physical activity and, (d) safety (Sallis et al., 2008). These concepts served as the foundation for this research.

The ecological model is continuously being used to help determine the variables involving physical activity behaviors and physical environment (Saelens, Sallis, Black, & Chen, 2003). Demographics, such as income and geographic location, can influence physical activity levels (Kegler, Swan, Alcantara, Wrensford, & Glanz, 2012). There are varying factors that can influence the use and non-use of the physical environment.

Accessibility and convenience. The ease of access and convenience of physical activity resources plays a role in the frequency and manner of use of the physical environment. People use the physical environment for exercise, relaxation, and

transportation (CDC, 2012b). The United States Department of Transportation, report reveals just how much convenience may impact physical activity (United States Department of Transportation [USDOT] & Federal Highway Administration [FHA], n.d.). In this research, participants self-reported trips to school, church, work, and social destinations. The range indicated a willingness to walk if the destination was within one mile. The outcome changed when the destination was within three to four miles away. Adult women ranging from 18 to 85 years old reported most miles of walking for social and recreational purposes, followed by family and personal business (USDOT & FHA, n.d.). Cycling was most reported for trips consisting of two to four miles to reach their destinations (USDOT & FHA, n.d.). Calise, Dumith, DeJong, and Kohl (2012) also concluded a built environment designed to allow for an easy commute to work, dining, or shopping results in an increase of physical activity.

However, a change in accessibility may not have an impact on women who actively engage in physical activity with existing physical environment structures. Evenson, Herring, and Huston (2005) reported a newly constructed trail did not increase physical activity. Women continued to use the already existing sidewalks in their neighborhoods. It was conveyed it may be beneficial to develop a trail in an area that reports less accessibility to the physical environment to increase physical activity. Furthermore, low accessibility to engage in physical activity in the physical environment creates a low-walkable environment (Adams et al., 2005). "Profiling neighborhoods may reveal neighborhood types in need for targeted improvements for public health

interventions" (Adams et al., 2005, p. 330). This strategy would allow for improvement of access, walkability and increased physical activity.

Aesthetics. Women have varying views when it comes to the aesthetics of the physical environment. Some women may perceive wooded environments as dangerous and intimidating, whereas other women may enjoy the scenery and the challenge it provided (Krenichyn, 2006). Some women find comfort engaging in an environment with other similar people. Whereas other women have found unwanted attention from people when engaging in physical activity in environments that are not necessarily used primarily for physical activity (Krenichyn, 2006). Similarly, elevated or hilly environments have also influenced activity (Nguyen, Lecoultre, Hills, & Scutz, 2013). Adults engaged in more walking when the ground was more level compared to an incline in elevation (Nguyen et al., 2013).

Safety. Adult women perceive safety in the physical environment from the perspective of (a) people's behaviors, (b) motorists' behaviors, (c) animals, (d) weather conditions, (e) physical conditions of the sidewalk or path, and (f) the comfort of having a companion while engaging in physical activity (Eyler & Vest, 2002; Osuji, Lovegreen, Elliott, & Brownson, 2006; Roman & Chalfin, 2008). When safety was not a concern, a higher rate was reported of trail use (Paxton et al., 2005). It was also found that people are more likely to walk if they feel safe (CDC, 2012b). Sallis (2014) reported that cycling behaviors would increase if people felt safe cycling in their physical environment.

Safety is a concept that relates to all of the domains used in this research. When safety is feared, it will hinder the perception of the environment and prevent physical activity. The perception of safety and crime impacted physical activity outdoors (Roman & Chalfin, 2008). Neighborhood safety emerged as an important determinant of walking for exercise (Suminski et al., 2005).

Active transport. One of the reasons people walk is for transportation. Walking is part of the regimen for over 145 million adults (CDC, 2012b). Adults are more likely to walk for transportation when within one mile of their desired destination (CDC, 2012b). The convenience and accessibility to infrastructures influence active transportation. Sallis and colleagues reported, "A positive association with walking for transport in high-income than in low-income participants" (Sallis et al., 2009, p. 1290).

The City of Mankato (2010) published a policy to promote active transport through connectivity between sidewalks and to re-examine land use for walkability. The city is striving to increase walking and cycling (City of Mankato, 2010). Active transport can increase daily physical activity (Besser & Dannenberg, 2005).

Sustainability. Sustainability is believed to be an important element of the ecological model (Stokols, Grzywacz, McMahan, & Phillips, 2003). Sustainability allows for interventions to continue on without continuously being dependent on annual budgets. This would likely lead to an intervention that would be carried out longer (Stokols et al., 2003). Minnesota communities have created strategic plans to increase physical activity (Envision 2020, 2011). The plans focused primarily on the design of the physical environment. Plans have consisted of connectivity of sidewalks and promoting

people to walk and cycle for modes of transportation (Anoka County Community Health & Environmental Services Department, 2009; City of Mankato, 2010). The improvement of accessibility and connectedness to the built environment may persuade people to increase physical activity on its own. Stokols and colleagues (2003) addressed the significance of developing self-sustainability as it means that the community does not have to rely heavily on funding resources to be successful and for continuation of a program

Summary

The literature reviewed revealed a relationship between the perceptions of the environment, and how it can influence women's physical activity behaviors. It also concluded active transport is being widely considered to increase physical activity in communities. The literature reviewed indicated the need to increase physical activity but also acknowledged women's perceptions of the environment. Again, women's positive perceptions of the physical environment are likely to promote physical activity, whereas negative perceptions are prone to inhibit activity. Physical environment with the promotion of active transport may lead to increased physical activity and sustainability in communities due to the improvement of the built environment. The methods for Physical Environment and Women's Physical Activity Behaviors are presented in the next chapter.

Chapter Three: Methodology

The purpose of this research was to determine adult women's perceptions of their physical environment. The research also investigated if a correlation existed between variables regarding women's physical activity behaviors. Active transport data was gathered to determine the number of women using cycling and walking as modes of transportation. Descriptive research was conducted using a cross-sectional electronic survey. An electronic survey was sent to personnel at Minnesota State University, Mankato using campus email addresses. The survey was accessed by opening a link inside the email. The survey was designed to determine women's perceptions of the physical environment and correlations between variables. The survey was developed by Sallis (2013a, 2013b) using the concepts of the Ecological Model. The questions specifically addressed accessibility and convenience, aesthetics, active transport, physical activity, and safety. This chapter will describe the methods used to address the following research questions:

1. What are women's perceptions of their physical environment?
2. How are women's perceptions of the physical environment associated with their physical activity behaviors?
3. How much is cycling used as a mode of transportation by participants?
4. How much is walking used as a mode of transportation by participants?

The methodology will focus on the research design, subject selection, instrumentation, procedure, data collection methods, data process, and analysis.

Research Design

This research collected data using a cross-sectional electronic survey. The survey instrument was developed using questions from Sallis's Neighborhood Environment Walkability Scale- Confirmatory Factor Analysis and Neighborhood Quality of Life Survey (Sallis, 2013a, 2013b). The questions used from the Neighborhood Environment Walkability Scale-Confirmatory Factor Analysis survey addressed perceptions of accessibility, aesthetics, convenience, and safety in the physical environment. Participants responded using Likert type items ranging from strongly disagree (1) to strongly agree (4). The Neighborhood Quality of Life Survey was used to collect demographic information, active transport behaviors, and physical activity behaviors other than for transportation. The combined surveys allowed for all research questions to be addressed.

Participants

Data was collected from adult women employed at Minnesota State University, Mankato. The participant's employment email contact information was gathered with the assistance of the Department of Information and Technology Services. An email linked with the survey was delivered to 526 female employees at Minnesota State University, Mankato. Participants were able to take part in an electronic survey at their own choice of time during the published dates. The method of an electronic survey was convenient for users to access on their own time.

An email was sent out to 526 female employees at Minnesota State University, Mankato. Twenty-three emails were received immediately stating the employee was not

physically on campus. The total number of potential participants was not altered due to the online availability of this survey. In addition, there were 23 incomplete or unverified cases; therefore, their data was removed before analyzing. The actual response rate was 200 (38%) and the adjusted response rate was 177 (34%) surveys completed. This study did not have enough responses to generate a representative sample following Krejcie and Morgan's (1970) guidance on the number of required responses to have a true representative sample size for research. The number of responses needed for this study to be a representative sample was 221 (42%) cases (Krejcie & Morgan, 1970).

Instrumentation

The electronic survey was created using Sallis's Neighborhood Quality of Life Study survey and Neighborhood Environment Walkability Scale- Confirmatory Factor Analysis survey (2013a, 2013b). The Neighborhood Environment Walkability Scale- Confirmatory Factor Analysis was developed to "assess perceptions of the environment related to physical activity" (Sallis, 2013a, para. 1). Participants were asked about their perceptions of accessibility, aesthetics, convenience, and safety of their physical environment. Questions include: connectivity of sidewalks, street lights, motorist behaviors, and appealing scenery (Sallis, 2013a). Responses were formatted using Likert type items ranging from strongly disagree to strongly agree. The Neighborhood Quality of Life Survey was developed to "study built environment associations with health behaviors" (Sallis, 2013b, para. 1). Participants were then asked to recall their active transportation behaviors and leisure-time, moderate, and vigorous physical activity behaviors (Sallis, 2013b). The combination of Sallis's two measures addressed the

research questions. The questions selected from the measures were not changed.

However, questions were eliminated being this research did not focus on all domains of the Ecological Model.

The replication of the research is possible due to the validity and reliability of the survey instrument used. Saelens and associates reported (2003):

Our findings strongly supported the test-retest reliability and validity of a new self-report measure of neighborhood environment characteristics hypothesized to be related to lifestyle physical activity, particularly walking for transport. Most of the NEWS subscales had test-retest reliability above .75, which is a high level of consistency. (Saelens et al., 2003, p. 1555)

The validity of the Neighborhood Environment Walkability Scale was further established stating, "Neighborhood Environment Walkability Scale has been validated in several countries" (Sallis, 2013a, para. 1). In regard to the Neighborhood Quality of Life Study survey, "The construct validity of the four-component walkability index was strongly supported. The pattern of more walking in high-walkability neighborhoods provides initial support for the validity of the walkability index" (Frank et al., 2010, p. 932). There are two questions from the Neighborhood Environment Walkability Scale survey that reported poor reliability, "although higher than recommended, these two values are likely to yield ignorable estimation biases" (Cerin, Conway, Saelens, Frank, & Sallis, 2009, para. 1).

The survey consisted of six sections addressing the perceptions of the environment using a four point Likert type items (Sallis, 2013a). The final two sections

addressed the physical activity behaviors in the environment. Participants were asked to recall their physical activity within the past seven days for active transport and activity other than transportation purposes using open-ended questions. Sallis's survey instruments were available for use as stated by his website through the University of California, San Diego.

Procedure

This research was approved by the Institutional Review Board at Minnesota State University, Mankato. The College of Graduate Studies at Minnesota State University, Mankato also approved this research to collect data electronically using campus emails as a method of recruitment. A list of campus email addresses was provided by the Department of Information and Technology Services. The survey was developed using Qualtrics™.

Data Collection

The electronic survey was sent as a link to the participants' institution email address. The survey was sent to participants on March 18, 2014 and a reminder email was sent on March 22, 2014. The survey closed on March 24, 2014. The completed survey results were accessible through, Qualtrics™, the online survey account where the survey was created. The data was accessed only on a secured computer.

Data Processing

Statistical Package for the Social Sciences was used to analyze the data collected from Qualtrics™. The survey questions were assigned a numeric property to help determine the relationship between the variables. The Likert type items ranged from

strongly disagree (1) to strongly agree (4). Physical activity duration questions were changed to minutes.

Data Analysis

The following includes how the survey instrument was used to address and analyze each research question.

What are women's perceptions of their physical environment? This research question was analyzed using data from section II- Access to Services, section III- Streets in My Neighborhood, Section IV - Places for Walking and Cycling, section V- Neighborhood Surroundings, section VI- Traffic Hazards, and section VII- Neighborhood Safety on the electronic survey. The questions addressed perceived environment factors accessibility, aesthetics, convenience, and safety using four point Likert type items. Descriptive statistics and frequencies were analyzed to answer this question.

How are women's perceptions of the physical environment associated with their physical activity behaviors? This research question was analyzed using a bivariate correlation report. The data from section II through section VII as defined above was correlated with section VIII – Transportation Physical Activity and section IX- Physical Activity other than for Transportation. The physical activity questions were open-ended questions Sallis (2013b) used from the International Physical Activity Questionnaire.

How much is cycling used as a mode of transportation by participants? This research question was answered from the data received from section VIII- Transportation

Physical Activity. These questions were open-ended. Frequency and duration reports were used to address this question.

How much is walking used as a mode of transportation by participants? This research question was answered from the data received from section VIII- Transportation Physical Activity. These questions were open-ended. Again, frequency and duration reports were used.

Summary

The survey instruments developed by Sallis (2013a, 2013b) were able to gather the needed data to address the research questions. The instrument used the Ecological Model to ask participants about their perceptions of the environment, and later asked about their physical activity behaviors. The variety of questions allowed for the research to investigate descriptive statistics, Cronbach's Alpha, associations, frequencies, and durations. The results and conclusions from the data collection are presented in the next chapter.

Chapter Four: Results and Discussion

This study collected data with the purpose to identify women's perceptions of the physical environment, and to determine relationships between perceptions and physical activity behaviors. It also addressed women's active transport behaviors, such as walking or cycling to get from place to place. Statistical Package for Social Sciences was used to analyze descriptive statistics, frequencies, Cronbach's alpha reliability, and correlations of the data. Each research question is addressed in this chapter.

Demographic Characteristics of the Sample

The average age of the study participants was 45 years old ($SD = 12.51$). Approximately 95 percent of the participants identified as white/Caucasian ($n = 168$). Furthermore, a majority of the participants have a graduate degree ($n = 119, 67.2\%$) and have a household income greater than \$80,000 ($n = 95, 53.7\%$). In addition to the demographic questions, employees were asked to provide how far their commute was, in miles, from Minnesota State University, Mankato. Fifty percent of the participants had a commute within five miles or less to the university ($n = 88$). The demographic characteristics of the sample are provided in Table 1.

Table 1

Demographic Characteristics of the Sample

Characteristic	<i>n</i>	%	<i>M (SD)</i>
Age	177		45.31 (12.51)
21-29	18	10.4	
30-39	46	26.0	
40-49	40	22.7	
50-59	43	24.3	
60-69	28	15.9	
72	1	0.6	
Missing Data	1	0.6	
Race	177		
White/Caucasian	168	94.9	
Black/African American	3	1.7	
Hispanic	1	0.6	
Asian or Pacific Islander	1	0.6	
American Indian or Alaskan Indian	1	0.6	
Other	3	1.7	
Education	177		
Some College or Vocational Training	20	11.3	
Completed College or University	38	21.5	
Completed Graduate Degree	119	67.2	
Income	177		
< \$10,000	1	0.6	
\$20,000-\$29,000	1	0.6	
\$30,000-\$39,000	13	7.3	
\$40,000-\$49,000	14	7.9	
\$50,000-\$59,000	12	6.8	
\$60,000-\$69,000	14	7.9	
\$70,000-\$79,000	19	10.7	
\$80,000-\$89,000	20	11.3	
\$90,000-\$99,000	17	9.6	
> \$100,000	58	32.8	
Missing Data	8	4.5	

Table 1 (continued)

Characteristic	<i>n</i>	%	<i>M (SD)</i>
Residence	177		
Single Family House	154	87.0	
Multi-Family House	4	2.3	
Apartment	9	5.1	
Condominium/Townhouse	7	4.0	
Other	2	1.1	
Missing Data	1	0.6	
Commute (Miles)	177		
> 1.0	14	8.1	
1.0- 5.0	74	41.9	
6.0- 10.0	30	17.0	
11.0- 15.0	16	9.1	
16.0-20.0	10	5.7	
21.0- 25.0	7	4.0	
26.0- 30.0	6	3.4	
31.0- 35.0	3	1.7	
36.0- 40.0	5	2.9	
41.0- 45.0	3	1.7	
46.0- 50.0	1	0.6	
51.0- 55.0	1	0.6	
56.0- 60.0	1	0.6	
61.0- 65.0	0	0.0	
66.0- 70.0	1	0.6	
71.0- 75.0	1	0.6	
76.0- 80.0	2	1.2	
81.0- 85.0	1	0.6	
86.0- 90.00	1	0.6	

Cronbach's Index of Internal Consistency (α) for Sallis's Perceptions of the Physical Environment Scale

The reliability of the perception related questions on the survey was examined using Cronbach's Index of Internal Consistency (see Table 2). Sallis's Neighborhood

Environment Walkability Scale has been previously proven reliable (Saelens et al., 2003). It was found that all sections of the survey: Services, Streets, Places, Neighborhood, Traffic, and Safety, had an acceptable Cronbach's alpha reliability coefficient of .70 or higher. The higher consistency was found in sections with a greater number of items. For example, Places for Walking and Cycling had 10 items, and a reliability coefficient of $\alpha = .89$. There were no individual items found to be significantly impacting the reliability in any of the scales.

Table 2

Cronbach's Index of Internal Consistency (α) for Sallis's Perceptions of the Physical Environment Scale

Scale	<i>n</i> of Items	<i>M</i> (<i>SD</i>)	α
Services	4	8.41 (3.11)	.70
Streets	3	8.01 (2.61)	.73
Places	10	25.67 (7.44)	.89
Neighborhood	6	18.23 (3.66)	.79
Traffic	6	17.99 (3.57)	.77
Safety	4	14.35 (1.80)	.77

What are Women's Perceptions of the Physical Environment?

All of the questions from the survey that addressed women's perceptions of the physical environment are provided in Table 3. Women were asked whether they strongly

agree (4) or strongly disagree (1) with statements addressing the Ecological Model concepts of accessibility, aesthetics, convenience, and safety. Sallis created the Neighborhood Environment Walkability Scale-Confirmatory Factor Analysis survey addressing these concepts asking statements about Access to Services, Streets in the Neighborhood, Places for Walking and Cycling, Neighborhood Surroundings, Traffic Hazards and Neighborhood Safety. Participants strongly disagreed that stores and places are easy walking distance of their home (see Table 3).

The mean and standard deviation for each scale is provided in Table 4. The mean score of the participants' perceptions of Safety was 3.59 ($SD = 0.45$). This would indicate participants somewhat agree/strongly agree with the statements involving Safety in their neighborhood. A significant number of the participants strongly disagreed with the statement, "the crime rate in my neighborhood makes it unsafe to go on walks during the day" ($n = 158, 89.3\%$) (Sallis, 2013a). The statements that averaged strongly agree to somewhat agree were Safety ($\bar{X} = 3.59, SD = 0.45$), Neighborhood ($\bar{X} = 3.04, SD = 0.61$), and Traffic ($\bar{X} = 3.00, SD = 0.59$). The statements that had a mean score of somewhat disagree to somewhat agree were Services ($\bar{X} = 2.10, SD = 0.78$), Places ($\bar{X} = 2.57, SD = 0.74$), and Streets ($\bar{X} = 2.67, SD = 0.87$) (see Table 4).

Table 3

Perceptions of the Physical Environment

Characteristic	Strongly Disagree n (%)	Somewhat Disagree n (%)	Somewhat Agree n (%)	Strongly Agree n (%)
Services				
I can do most of my shopping at local stores	50 (28.2)	15 (8.5)	41 (23.2)	71 (40.1)
Stores are within easy walking distance of my home	102 (57.6)	40 (22.6)	24 (13.6)	11 (6.2)
There are many places to go within easy walking distance of my home	71 (40.1)	51 (28.8)	33 (18.6)	22 (12.4)
It is easy to walk to a transit stop (bus, train) from my home	88 (49.7)	32 (18.1)	31 (17.5)	25 (14.1)
Streets				
The distance between intersections in my neighborhood is usually short (100 yards or less; the length of a football field or less)	27 (15.3)	28 (15.8)	60 (33.9)	60 (33.9)
There are many four-way intersections in my neighborhood	45 (25.4)	43 (24.3)	48 (27.1)	39 (22.0)
There are many alternative routes for getting from place to place in my neighborhood (I don't have to go the same way every time)	38 (21.5)	30 (16.9)	64 (36.2)	45 (25.4)

Table 3 (continued)

Characteristic	Strongly Disagree n (%)	Somewhat Disagree n (%)	Somewhat Agree n (%)	Strongly Agree n (%)
Places				
There are sidewalks on most of the streets in my neighborhood	57 (32.2)	24 (13.6)	49 (27.7)	46 (26.0)
The sidewalks in my neighborhood are well maintained (paved, even, and not a lot of cracks)	45 (25.4)	32 (18.1)	59 (33.3)	38 (21.5)
There are bicycle or pedestrian trails in or near my neighborhood that are easy to get to	47 (26.6)	32 (18.1)	56 (31.6)	41 (23.2)
Sidewalks are separated from the road/traffic in my neighborhood by parked cars	66 (37.3)	41 (23.2)	52 (29.4)	17 (9.6)
There is a grass/dirt strip that separates the streets from the sidewalks in my neighborhood	44 (24.9)	18 (10.2)	56 (31.6)	57 (32.2)
It is safe to ride a bike in or near my neighborhood	17 (9.6)	19 (10.7)	74 (41.8)	66 (37.3)
My neighborhood streets are well lit at night	30 (16.9)	39 (22.0)	78 (44.1)	26 (14.7)
Walkers and bikers on the streets in my neighborhood can be easily seen by people in their homes	16 (9.0)	25 (14.1)	80 (45.2)	50 (28.2)
There are crosswalks and pedestrian signals to help walkers cross busy streets in my neighborhood	61 (34.5)	37 (20.9)	54 (30.5)	24 (13.6)
The crosswalks in my neighborhood help walkers feel safe crossing busy streets	50 (28.2)	39 (22.0)	64 (36.2)	19 (10.7)

Table 3 (continued)

Characteristic	Strongly Disagree n (%)	Somewhat Disagree n (%)	Somewhat Agree n (%)	Strongly Agree n (%)
Neighborhood				
There are trees along the streets in my neighborhood	12 (6.8)	18 (10.2)	70 (39.5)	77 (43.5)
Trees give shade for the sidewalks in my neighborhood	34 (19.2)	28 (15.8)	61 (34.5)	47 (26.6)
There are many interesting things to look at while walking in my neighborhood	13 (7.3)	37 (20.9)	78 (44.1)	46 (26.0)
My neighborhood is generally free from litter	4 (2.3)	14 (7.9)	82 (46.3)	76 (42.9)
There are many attractive natural sights in my neighborhood (such as landscaping, views)	10 (5.6)	34 (19.2)	72 (40.7)	59 (33.3)
There are attractive buildings/homes in my neighborhood	9 (5.1)	23 (13.0)	91 (51.4)	53 (29.9)
Traffic				
There is so much traffic along the street I live on that it makes it difficult or unpleasant to walk in my neighborhood	86 (48.6)	58 (32.8)	26 (14.7)	5 (2.8)
There is so much traffic along <u>nearby</u> streets that it makes it difficult or unpleasant to walk in my neighborhood	65 (36.7)	57 (32.2)	40 (22.6)	13 (7.3)
The speed of traffic on the street I live on is usually slow (30 mph or less)	15 (8.5)	21 (11.9)	62 (35.0)	79 (44.6)
The speed of traffic on most <u>nearby</u> streets is usually slow (30 mph or less)	25 (14.1)	42 (23.7)	67 (37.9)	43 (24.3)
Most drivers exceed the posted speed limits while driving in my neighborhood	18 (10.2)	62 (35.0)	74 (41.8)	21 (11.9)
When walking in my neighborhood there are a lot of exhaust fumes (such as from cars, buses)	94 (53.1)	68 (38.4)	12 (6.8)	2 (1.1)

Table 3 (continued)

Characteristic	Strongly Disagree n (%)	Somewhat Disagree n (%)	Somewhat Agree n (%)	Strongly Agree n (%)
Safety				
There is a high crime rate in my neighborhood	108 (61.0)	60 (33.9)	9 (5.1)	0 (0.0)
The crime rate in my neighborhood makes it unsafe to go on walks <u>during the day</u>	158 (89.3)	18 (10.2)	0 (0.0)	0 (0.0)
The crime rate in my neighborhood makes it unsafe to go on walks <u>at night</u>	98 (55.4)	59 (33.3)	18 (10.2)	1 (0.6)
My neighborhood is safe enough so that I would let a 10-year-old boy walk around my block alone in the daytime	4 (2.3)	15 (8.5)	59 (33.3)	97 (54.8)

Table 4

Scale Descriptive Statistics for Perceptions of the Physical Environment

Characteristic	<i>n</i>	Mean	Std. Deviation
Services	176	2.10	.78
Streets	173	2.67	.87
Places	159	2.57	.74
Neighborhood	167	3.04	.61
Traffic	171	3.00	.59
Safety	173	3.59	.45

How are Women's Perceptions of the Physical Environment Associated with Their Physical Activity Behaviors?

Two relationships were found between the participants' perceptions of their environment and their physical activity. The participants' perceptions related to Access to Services was positively associated with their Biking from Place to Place ($r = .15, p < .05$). The other significance found was within Streets in my Neighborhood and Vigorous Physical Activity ($r = .14, p < .05$). It is considered a weak relationship when the correlation is below a .40 (Dignan, 1995). No other significant relationships were found between the participants' perceptions of the physical environment and their physical activity behaviors.

Table 5

Pearson Correlation Coefficients (r) Between Women's Perceptions and Their Physical Activity Behaviors

Perceptions	Physical Activity				
	BikePP	WalkPP	Leisure	Moderate	Vigorous
Services	.15*	.11	-.05	-.00	.07
Streets	.04	.12	.05	-.04	.14*
Places	-.06	.04	.05	-.10	-.01
Neighborhood	.07	.09	-.05	.03	.04
Traffic	-.09	.04	.04	-.08	.01
Safety	.06	.06	-.06	.05	-.07

* $p < .05$. ** $p < .01$.

How Much is Cycling and Walking Used as Modes of Transportation?

A majority of the participants ($n = 173$, 97.7%) responded that they did not cycle in the last seven days. Three responses (1.8%) indicated they had cycled. However, six participants reported cycling from ten minutes to 45 minutes in one of those days (see Table 6 and Table 7).

More than half indicated they had walked for transportation in the last seven days ($n = 93, 52.5\%$). That left 81 responses (45.8%) indicating they did not walk for transportation in the last seven days. The most frequent duration was 30 minutes among those who indicated they walked to get from place to place ($n = 31, 17.5\%$) (see Table 6 and Table 7).

Table 6

Frequency of Transportation by Cycling and Walking

Days	<i>n</i>	%
Cycling	176	
0	173	97.7
1	1	0.6
3	1	0.6
6	1	0.6

Table 6 (continued)

Days	<i>n</i>	%
Walking	174	
0	81	45.8
1	11	6.2
2	10	5.6
3	9	5.1
4	10	5.6
5	27	15.3
6	3	1.7
7	23	13.0

Table 7

Duration of Transportation by Cycling and Walking

Minutes	<i>n</i>	%
Cycling	177	
0.0	171	96.6
10.0	1	0.6
20.0	2	1.1
30.0	2	1.1
45.0	1	0.6
Walking	177	
Missing Data	1	0.6
0.0	80	53.7
5.0	1	0.6
10.0	9	5.1
11.0	1	0.6
12.0	1	0.6
15.0	5	2.8
20.0	17	9.6
25.0	2	1.1
30.0	31	17.5

Table 7 (continued)

Minutes	<i>n</i>	%
Walking		
40.0	4	2.3
45.0	4	2.3
50.0	2	1.1
60.0	8	4.5
70.0	1	0.6
80.0	2	1.1
90.0	1	0.6
100.0	1	0.6
120.0	3	1.7
180.0	1	0.6
300.0	1	0.6
420.0	1	0.6

The temperature and weather conditions for the last seven days from the perspective of the opening day of the survey through the ending day of the survey are provided in Figures 1 and 2. A participant who completed the survey on March 18, 2014 were required to recall behaviors from as far back as March 11, 2014. Weather was

recorded for purposes of future studies to be able determine if any relationships exist with weather and physical activity behaviors in the physical environment.

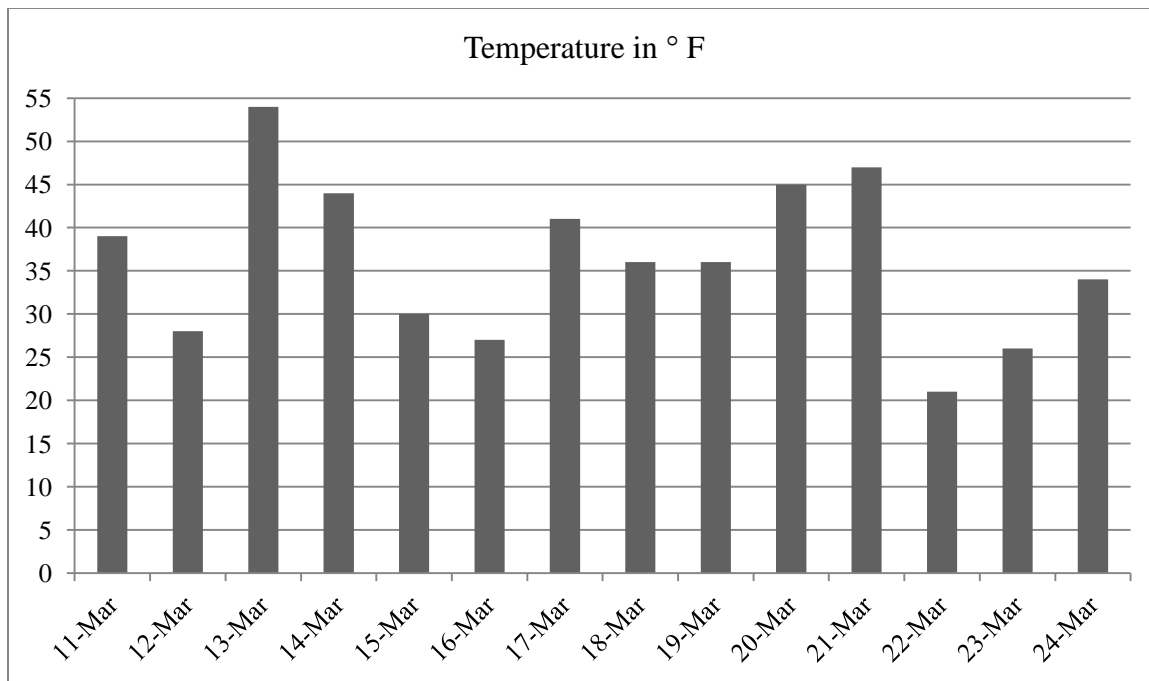


Figure 1. Temperature Measured in ° Fahrenheit from March 11, 2014 through March 24, 2014

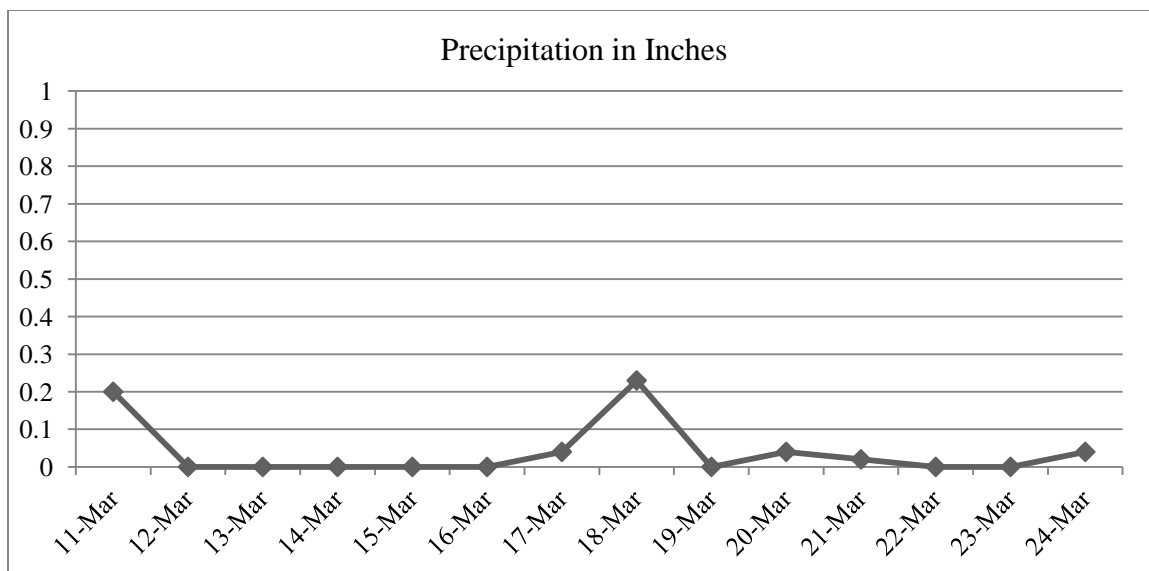


Figure 2. Precipitation Measured in Inches from March 11, 2014 through March 24, 2014

Summary

Half of the participants lived within five miles from Minnesota State University, Mankato. The participants agreed with the perception statements regarding Safety, Neighborhood, and Traffic in the physical environment. Participants tended to disagree with statements that pertained to Services, Places, and Streets in their neighborhood. When analyzing the relationships between perceptions and physical activity behaviors only two significant but weak relationships existed between Access to Services and Biking from Place to Place ($r = .15, p < .05$). The other significance was within Streets in my Neighborhood and Vigorous Physical Activity ($r = .14, p < .05$). Walking was a common form of active transport for participants in this study. Almost all participants reported zero times cycling in the last seven days ($n = 173, 97.7\%$). Conclusions, discussions and recommendations are presented in Chapter Five.

Chapter Five: Conclusions, Discussion, and Recommendations

Over half of United States adult women are not meeting the recommended guidelines of physical activity per week (NCHS, 2012b). The physical environment is an affordable resource for people to engage in physical activity. This study asked participants for their perceptions of the physical environment. Perceptions were determined through the use of descriptive statistics and frequencies. It also identified relationships within perceptions of the physical environment and physical activity behaviors. The relationships were analyzed using the bivariate correlation to determine if any associations existed in this study. Lastly, this study determined the frequency that women engaged in active transport. Women's active transport behaviors were analyzed by number of days per week, and the duration of minutes on one of their active days.

Conclusions

Participants of this study were female employees at Minnesota State University, Mankato. Participants completed a survey asking for their perceptions of the environment and their recollected physical activity behaviors. The perception responses were Likert type items ranging from strongly disagree to strongly agree. The most disagreed perception statements were pertaining to accessibility and convenience. The CDC is providing funding to states in the United States to further develop communities to be accessible, convenient, and safe environments in efforts to increase physical activity (CDC, 2013b). The CDC has recognized perceptions of accessibility and convenience as areas at address to increase physical activity. The most agreed statements were within perceptions of safety and aesthetics of the environment.

Women's reported physical activity behaviors were minimal in each area of activity: for transportation purposes and for purposes other than transportation. The low reported amounts of physical activity may have impacted the correlations. There were two slight correlations found. The first significance was found between Access to Services and Biking from Place to Place ($r = .15, p < .05$). The second significance was found within Streets in my Neighborhood and Vigorous Physical Activity ($r = .14, p < .05$).

The reported numbers for engaging in cycling in the last seven days were three responses (1.8%) and 93 responses (52.5%) for walking. Many participants use walking as a method of transportation. As previously stated, over 145 million adults engage in walking for various purposes (CDC, 2012b). The weather was noticeably warmer at the time of the study compared to previous weeks leading up to the study. The ground was still covered in snow, which may have led to less physical activity in the environment. Seasonal variation does exist; Bike Walk Twin Cities (2013) reported their lowest cycling numbers during the winter months.

Discussion

Limited responses are indicative to low association findings. The researcher was unable to identify strong relationships between physical activity behaviors and perceptions of the environment. The low reported numbers could be a result of this study being conducted in the winter months. Women's physical activity behaviors may differ by season. As stated before, the study was required to eliminate 23 incomplete and unverified surveys. In addition, data was removed in the physical activity portion due to

incorrect responses that did not fit the parameters of the question. The unknown relationships of the perceptions and physical activity behaviors leads to several questions and suggestions for future studies.

In comparison to studies previously referenced, the women's perceptions that have prevented physical activity in the environment included safety as a major concern. The women's overall responses regarding perception of safety were strongly agreed to somewhat agreed (3.59 out of 4.00). These statements addressed crime and feeling safe at different times of the day in their neighborhood. Interestingly, when safety is feared it is a barrier to the physical environment and when not feared the environment is more likely to be used (Paxton et al., 2005). There was no significant relationship between safety and physical activity behaviors in the physical environment in this study.

The data indicated that 88 participants (50%) lived within five miles from Minnesota State University, Mankato. The USDOT & FHA (n.d.) reported a willingness to walk if the destination was within one mile. Fourteen participants or 8.1% of the participants lived within one mile. Willingness changed when the destination was within three to four miles away (USDOT & FHA, n.d.). Cycling was most reported for trips consisting of two to four miles to reach their destinations (USDOT & FHA, n.d.). Three participants (1.8%) indicated they cycled in the last seven days. After comparing this report to the findings, the question remains with weather conditions. It would be intriguing to determine if women's active transport behaviors are comparable when weather conditions improve.

Recommendations for Health Educators

It is recommended to educate women on methods to increase physical activity. This may include educating and promoting through a gender specific employee wellness program. There could be individual training, small group meetings, and online formats to encourage activity. A weekly group could meet to walk the fitness trail and sidewalks the university offers. The program could entail incentives to increase active transport and physical activity behaviors. Employees could track their physical activity behaviors. Once they have met a designated number they could request to be reimbursed or request a payment for something wellness related. There would be established guidelines on the maximum amount, and type of purchases that would be considered wellness related. This information would be provided to employees.

Cycling, as a mode of transportation, reported the lowest numbers of activity with 97.7% of participants indicating no activity. Health educators may teach bike safety classes to the public to reduce fears of cycling alongside motorized vehicles (Sallis, 2014). This class could also address other feared perceptions related to cycling to promote this activity.

Many communities have developed sustainability or healthy living plans to promote physical activity through active transport. It is recommended to approach or communicate with city officials to look at proposed or existing plans. The health educator could recommend considering the accessibility, aesthetics, convenience and safety perceptions of an area being created or already existing where the activity is anticipated to take place.

Recommendations for Further Studies

It is recommended to replicate this study to determine if seasons and geographic location alter the findings. Based on this study's results, it would be purposeful to add structured data questions to gain a better understanding of physical activity behaviors to be inclusive of other forms of environment.

It is also recommended to modify the physical activity behavior portion of the survey. It would be best to limit the responses to the maximum amount possible to prevent having to eliminate valuable responses. If the question is asking how many days per week, limit the response to maximum number of seven days. This change should also be completed for the questions regarding time spent engaging in physical activity with hours (24) and minutes (59).

Another recommendation would be to administer the survey to a population that lives in a specific geographic location. This would allow for future improvements to be implemented addressing the perceptions of the target audience. The variation in commuters in this study varied from 0.0 to 90.0 miles from the university.

It is highly suggested to provide an incentive to participants to increase response rate. An increased response rate would have allowed for a representative size in this study.

REFERENCES

- Adams, M. A., Sallis, J. F., Kerr, J., Conway, T. L., Saelens, B. E., Frank, L.D.,...Cain, K. L. (2005). Neighborhood environment profiles related to physical activity and weight status: A latent profile analysis. *Preventive Medicine, 52*, 326-331. doi: 10.1016/j.ypmed.2011.02.020
- Anoka County Community Health & Environmental Services Department. (2009). *Anoka county community health interventions plan 2010-2014*. Retrieved from http://www.co.anoka.mn.us/v2_dept/ches/documents/Community%20Health%20Priority%20Interventions%20Plan%202010-2014.pdf
- Besser, L. M., & Dannenberg, A. L. (2005). Walking to public transit steps to help meet physical activity recommendations. *American Journal of Preventive Medicine, 29*, 273-280. doi: 10.1016/j.ampre.2005.06.010
- Bike Walk Twin Cities. (2013). *Bike walk Twin Cities 2013 count report*. 1-24. Retrieved from <http://www.bikewalktwincities.org/>
- Calise, T., Dumith, S. C., DeJong, W., & Kohl III, H. W. (2012). The effect of a neighborhood built environment on physical activity behaviors. *Journal of Physical Activity & Health, 9*, 1089-1097. Retrieved from <http://web.ebscohost.com/ehost/pdfviewer/pdfviewer?sid=9f42fedf-7d22-45dc-ac28-4142f93efea9%40sessionmgr11&vid=4&hid=19>
- Centers for Disease Control and Prevention. (2011a). *Health weight- it's not a diet, it's a lifestyle!* Retrieved from <http://www.cdc.gov/healthyweight/assessing/bmi/>

- Centers for Disease Control and Prevention. (2011b). *Physical activity*. Retrieved from <http://www.cdc.gov/physicalactivity/everyone/guidelines/adults.html>
- Centers for Disease Control and Prevention. (2011c). *Physical activity*. Retrieved from <http://www.cdc.gov/physicalactivity/everyone/getactive/barriers.html>
- Centers for Disease Control and Prevention. (2011d). *Physical activity and health*. Retrieved from <http://www.cdc.gov/physicalactivity/everyone/health/>
- Centers for Disease Control and Prevention. (2012a). *Physical activity*. Retrieved from <http://www.cdc.gov/healthyplaces/healthtopics/physactivity.htm>
- Centers for Disease Control and Prevention. (2012b). *Vital signs*. Retrieved from <http://www.cdc.gov/vitalsigns/pdf/2012-08-vitalsigns.pdf>
- Centers for Disease Control and Prevention. (2013a). *Communities putting prevention into work*. Retrieved from http://www.cdc.gov/nccdphp/dch/programs/CommunitiesPuttingPreventiontoWork/resources/physical_activity.htm
- Centers for Disease Control and Prevention. (2013b). *Press release*. Retrieved from <http://www.cdc.gov/media/releases/2013/p0502-physical-activity.html>
- Cerin, E., Conway, T. L., Saelens, B. E., Frank, L. D., & Sallis, J. F. (2009). Cross-validation of the factorial structure of the neighborhood environment walkability scale (NEWS) and its abbreviated form (NEWS-A). *International Journal of Behavioral Nutrition and Physical Activity*, 6(32). doi: 0.86/479-5868-6-32
- City of Mankato. (2010). *City sustainability initiatives*. Retrieved from <http://www.mankato-mn.gov/sustainability-city/Page.aspx>

- County Health Rankings & Roadmaps. (2013). *Built environment*. Retrieved from <http://www.countyhealthrankings.org/our-approach/health-factors/built-environment>
- Dignan, M. B. (1995). *Measurement and evaluation of health education, 3rd edition*. Springfield, IL: Charles C Thomas Publisher.
- Envision 2020. (2011). *2010-2011 Envision 2020 progress report*. Retrieved from <http://www.envision-2020.com/wp-content/uploads/2009/04/E2020-Annual-Report-Fall-2011-Final-for-web.pdf>
- Evenson, K. R., Herring, A. H., & Huston, S. L. (2005). Evaluating change in physical activity with the building of a multi-use trail. *American Journal of Preventive Medicine, 28*(2S2), 171-185. doi: 10.1016/j.amepre.2004.10.020
- Eyler, A. A., & Vest, J. R. (2002). Environmental and policy factors related to physical activity in rural white women. *Women & Health, 36*, 109-121. Retrieved from http://www.tandfonline.com/doi/pdf/10.1300/J013v36n02_08
- Frank, L. D., Sallis, J. F., Saelens, B. E., Leary, L., Cain, K., Conway, T. L., & Hess, P. M. (2010). The development of a walkability index: Application to the neighborhood quality of life study. *British Journal of Sports Medicine, 44*, 924-933. doi: 10.1136/bjism.2009.058701
- Hoebeke, R. (2008). Low-income women's perceived barriers to physical activity: Focus group results. *Applied Nursing Research, 21*, 60-65. doi:10.1016/j.apnr.2006.06.002

- Kegler, M. C., Swan, D. W., Alcantara, I., Wrensford, L., & Glanz, K. (2012). Environmental influences on physical activity in rural adults: The relative contributions of home, church, and work settings. *Journal of Physical Activity & Health, 9*, 996-1003. Retrieved from <http://web.ebscohost.com/ehost/pdfviewer/pdfviewer?vid=3&sid=62dcd802-3780-4dd3-ab91-87743f13c155%40sessionmgr4003&hid=4114>
- Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Management, 30*, 607-610. Retrieved from: <http://opa.uprrp.edu/InvInsDocs/KrejcieandMorgan.pdf>
- Krenichyn, K. (2006). The only place to go and be in the city': Women talk about exercise, being outdoors, and the meanings of a large urban park. *Health & Place, 12*, 631-643. doi:10.1016/j.healthplace.2005.08.015
- National Center for Health Statistics. (2012a). *Health, United States: With special feature on emergency care*. Retrieved from <http://www.cdc.gov/nchs/data/hus/hus12.pdf#063>
- National Center for Health Statistics. (2012b). *Health, United States: With special feature on emergency care*. Retrieved from <http://www.cdc.gov/nchs/data/hus/hus12.pdf#067>

- Nguyen, D. M. T., Lecoultre, V., Hills, A. P., & Schutz, Y. (2013). How does a hilly urban environment influence daily physical activity in obese individuals? *Journal of Physical Activity & Health, 10*, 617-625. Retrieved from http://www.naspspa.org/AcuCustom/Sitename/Documents/DocumentItem/01_Nguyen_JPAH_20110142_617-625-ej.pdf
- Osuji, T., Lovegreen, S., Elliott, M., & Brownson, R. C. (2006). Barriers to physical activity among women in the rural Midwest. *Women & Health, 41*(1), 41-55. doi:10.1300/J013v44n01_03
- Paxton, R. J., Sharpe, P. A., Granner, M. L., & Hutto, B. (2005). Associations of sociodemographic and community environmental variables to use of public parks and trails for physical activity. *International Journal of Health Promotion & Education, 43*, 108-116. Retrieved from <http://www.tandfonline.com/doi/pdf/10.1080/14635240.2005.10708051>
- Roman, C. G., & Chalfin, A. (2008). Fear of walking outdoors a multilevel ecologic analysis of crime and disorder. *American Journal of Preventive Medicine, 34*, 306-312. doi: 10.1016/j.amepre.2008.01.017
- Saelens, B. E., Sallis, J. F., Black, J. B., & Chen, D. (2003). Neighborhood-based differences in physical activity: An environment scale evaluation. *American Journal of Public Health, 93*, 1552-1558. Retrieved from <http://web.ebscohost.com/ehost/pdfviewer/pdfviewer?vid=2&sid=e7e57b0c-f5ad-4e88-901b-2f176842c107%40sessionmgr112&hid=117>

- Sallis, J. F. (2013a). *Neighborhood environment walkability scale*. Retrieved from http://sallis.ucsd.edu/measure_news.html
- Sallis, J. F. (2013b). *Neighborhood quality of life survey*. Retrieved from http://sallis.ucsd.edu/measure_nqls.html
- Sallis, J. F. (2014). Improving bicycling safety could encourage more bicycling. *Research Brief*. Retrieved from http://sallis.ucsd.edu/Documents/Pubs_documents/Brief_Bicycling_012214.pdf
- Sallis, J. F., Owen, N., & Fisher, E. B. (2008). Ecological models of health behaviors. In K. Glanz, B. K. Rimer, & K. Viswanath (Eds.), *Health behavior and health education: Theory, research, and practice (4th ed.)* (pp. 465-485). San Francisco, CA: Jossey-Bass.
- Sallis, J. F., Saelens, B. E., Frank, L. D., Conway, T. L., Slymen, D. J., Cain, K. L.,...Kerr, J. (2009). Neighborhoods built environment and income: Examining multiple health outcomes. *Social Science & Medicine*, 68, 1285-1293. doi: 10.1016/j.socscimed.2009.01.017
- Suminski, R. R., Carlos Poston, W. S., Petosa, R. L., Stevens, E., & Katzenmoyer, L. M. (2005). Features of the neighborhood environment walking by U.S. adults. *American Journal of Preventive Medicine*, 28, 149-155. doi:10.1016/j.amepre.2004.09.009
- Stokols, D. (1992). Establishing and maintaining health environments toward a social ecology of health promotion. *American Psychologist*, 47, 6-22. Retrieved from <http://search.proquest.com/docview/614341169/fulltextPDF?accountid=12259>

- Stokols, D., Grzywacz, J. G., McMahan, S., & Phillips, K. (2003). Increasing the health promotive capacity of human environments. *American Journal of Health Promotion, 18*, 4-13. Retrieved from <http://web.ebscohost.com/ehost/pdfviewer/pdfviewer?vid=2&sid=4b8cf960-8257-4111-bfaf-9c905d7696b9%40sessionmgr12&hid=18>
- United States Department of Transportation & Federal Highway Administration. (n.d.). *2009 National Household Travel Survey*. Retrieved from <http://nhts.ornl.gov/det/Extraction3.aspx>
- World Health Organization. (2013a). *Media centre overweight and obesity*. Retrieved from <http://www.who.int/mediacentre/factsheets/fs311/en/index.html>

Appendix

Appendix A

Physical Environment and Women's Physical Activity Behaviors

This survey would like to find out more information about the way that you perceive or think about your neighborhood. Please answer the following questions about your neighborhood and yourself.

Section I: General Information

1. What is your age? (Please provide number)

_____ Years

2. What is your race? (Please select one)

- White/ Caucasian
- Black/ African American
- Hispanic
- Asian or Pacific Islander
- American Indian or Alaskan Native
- Other

3. What was your highest education level completed? (Please select one)

- Less than 7th grade
- Junior high/middle school
- Some high school
- Completed high school
- Some college or vocational training
- Completed college or university
- Completed graduate degree

4. What is your household's annual income? (Please select one)

- < 10,000
- \$10,000 - \$19,000
- \$20,000 - \$29,000
- \$30,000 - \$39,000
- \$40,000 - \$49,000
- \$50,000 - \$59,000
- \$60,000 - \$69,000
- \$70,000 - \$79,000
- \$80,000 - \$89,000
- \$90,000 - \$99,000
- > \$100,000

5. What type of residence do you live in? (Please select one)

- Single family house
- Multi-family house
- Apartment
- Condominium/townhouse
- Other

6. How far is your commute from your residence to Minnesota State University, Mankato by miles (e.g., .9 miles)? (Please provide to the nearest tenth if you live less than five miles away from campus)

_____Miles

Section II: Access to Services

Please select the answer that best applies to you and your neighborhood. Both local and within walking distance mean with a 10-15 minute walk from your home.

1. I can do most of my shopping at local stores.

- | | | | |
|----------------------|----------------------|-------------------|-------------------|
| 1 | 2 | 3 | 4 |
| strongly
disagree | somewhat
disagree | somewhat
agree | strongly
agree |

2. Stores are within easy walking distance of my home.

- | | | | |
|----------------------|----------------------|-------------------|-------------------|
| 1 | 2 | 3 | 4 |
| strongly
disagree | somewhat
disagree | somewhat
agree | strongly
agree |

3. There are many places to go within easy walking distance of my home.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

4. It is easy to walk to a transit stop (bus, train) from my home.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

Section III: Streets in My Neighborhood

Please select the answer that best applies to you and your neighborhood.

1. The distance between intersections in my neighborhood is usually short (100 yards or less; the length of a football field or less).

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

2. There are many four-way intersections in my neighborhood.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

3. There are many alternative routes for getting from place to place in my neighborhood. (I don't have to go the same way every time.)

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

Section IV: Places for Walking and Cycling

Please select the answer that best applies to you and your neighborhood.

1. There are sidewalks on most of the streets in my neighborhood.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

2. The sidewalks in my neighborhood are well maintained (paved, even, and not a lot of cracks.)

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

3. There are bicycle or pedestrian trails in or near my neighborhood that are easy to get to.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

4. Sidewalks are separated from the road/traffic in my neighborhood by parked cars.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

5. There is a grass/dirt strip that separates the streets from the sidewalks in my neighborhood.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

6. It is safe to ride a bike in or near my neighborhood.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

7. My neighborhood streets are well lit at night.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

8. Walkers and bikers on the streets in my neighborhood can be easily seen by people in their homes.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

9. There are crosswalks and pedestrian signals to help walkers cross busy streets in my neighborhood.

1	2	3	4
strongly	somewhat	somewhat	strongly

10. The crosswalks in my neighborhood help walkers feel safe crossing busy streets.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

Section V: Neighborhood Surroundings

Please select the answer that best applies to you and your neighborhood.

1. There are trees along the streets in my neighborhood.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

2. Trees give shade for the sidewalks in my neighborhood.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

3. There are many interesting things to look at while walking in my neighborhood.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

4. My neighborhood is generally free from litter.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

5. There are many attractive natural sights in my neighborhood (such as landscaping, views).

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

6. There are attractive buildings/homes in my neighborhood.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

Section VI: Traffic Hazards

Please select the answer that best applies to you and your neighborhood.

1. There is so much traffic along the street I live on that it makes it difficult or unpleasant to walk in my neighborhood.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

2. There is so much traffic along nearby streets that it makes it difficult or unpleasant to walk in my neighborhood.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

3. The speed of traffic on the street I live on is usually slow (30 mph or less).

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

4. The speed of traffic on most nearby streets is usually slow (30 mph or less).

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

5. Most drivers exceed the posted speed limits while driving in my neighborhood.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

6. When walking in my neighborhood there are a lot of exhaust fumes (such as from cars, buses).

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

Section VII: Neighborhood Safety

Please select the answer that best applies to you and your neighborhood.

1. There is a high crime rate in my neighborhood.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

2. The crime rate in my neighborhood makes it unsafe to go on walks during the day.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

3. The crime rate in my neighborhood makes it unsafe to go on walks at night.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

4. My neighborhood is safe enough so that I would let a 10-year-old boy walk around my block alone in the daytime.

1	2	3	4
strongly disagree	somewhat disagree	somewhat agree	strongly agree

Your Physical Activity

This research is interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions are about the time you spent being physically active in the **last 7 days**. They include questions about activities you do to get from place to place, and in your spare time for recreation, exercise or sport. Your answers are important.

Please answer each question even if you do not consider yourself to be an active person.

Section VIII: Transportation Physical Activity

These questions are about how you traveled from place to place, including to places like work, stores, movies, and so on.

1. During the last 7 days, on how many days did you travel in a motor vehicle like a train, bus, car or tram?

_____ days per week

2. How much time did you usually spend on one of those days traveling in a car, bus, train or other kind of motor vehicle?

_____ hours _____ minutes per day

Now think only about the bicycling and walking you might have done to travel to and from work, to do errands, or to go from place to place.

3. During the last 7 days on how many days did you bicycle for at least 10 minutes at a time to go from place to place?

_____ days per week

4. How much time did you usually spend on ONE of those days to bicycle from place to place?
_____hours _____ minutes per day
5. During the last 7 days on how many days did you walk for at least 10 minutes at a time to go from place to place?
_____days per week
6. How much time did you usually spend on ONE of those days to walking from place to place?
_____hours _____ minutes per day

Section IX: Physical Activity Other Than for Transportation

This section is about all the physical activities that you did in the last 7 days solely for recreation, sport, exercise or leisure. Please do not include any activities you have already mentioned from the last section for transportation.

1. Not counting any walking you have already mentioned, during the last 7 days, on how many days did you walk for at least 10 minutes at a time in your leisure time?
_____days per week
2. How much time did you usually spend on ONE of those days to walking in your leisure time?
_____hours _____ minutes per day
3. Think about only those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do vigorous physical activities like aerobics, running, fast bicycling, or fast swimming in your leisure time?
_____days per week
4. How much time did you usually spend on ONE of those days doing vigorous physical activities in your leisure time?
_____hours _____ minutes per day

5. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the last 7 days on how many days did you do moderate physical activities like bicycling at a regular pace, swimming at a regular pace, or playing doubles tennis in your leisure time?

_____ days per week

6. How much time did you usually spend on ONE of those days doing moderate physical activities in your leisure time?

_____ hours _____ minutes per day

Thank you for completing the Physical Environment and Women's Physical Activity Behaviors Survey.

Appendix B

Dear Minnesota State University, Mankato Employee,

My name is Beth Brisky and I am a graduate student in the Health Science Department of Minnesota State University, Mankato currently working on my thesis. My research is titled, "Physical Environment and Women's Physical Activity Behaviors." The goal of this research is to identify women's perceptions of the physical environment. It also strives to determine if any associations exist with the perceptions of the environment and physical activity behaviors. This survey will take approximately 5-10 minutes to complete. It will close at 5:00 p.m. on March 27, 2014.

This research project is being directed by Dr. Marlene Tappe. Contact Dr. Tappe at 507-389-26861, 213 Highland Center North, or marlene.tappe@mnsu.edu if you have concerns about this project. You may contact the Minnesota State University, Mankato Institutional Review Board Administrator, Dr. Barry Ries at 507-389-2321 or barry.ries@mnsu.edu if you have questions about rights of research participants.

Participation in this survey is voluntary. You have the option to not respond to any questions that you choose and the right to stop at any time. Your decision whether to participate will not affect your relationship with Minnesota State University, Mankato. There are no direct benefits to you as a result of your participation in this research. Participating in this research will, however, help the researchers understand women's perceptions of the physical environment and how these perceptions may be associated with participation in physical activity. This understanding will be helpful in the planning and implementation of initiatives designed to increase physical activity among women.

Please be aware that whenever one works with the internet and/or email there is always a risk for compromising privacy, confidentiality, and/or anonymity. No data identifying individuals will be included in the data base. All analyses of the data will be at a group level and only group level data will be reported in the thesis document, thesis defense, and any potential presentations or publications.

Therefore, there is minimal risk associated with participation in this study and it is no more than experienced in daily life.

If you would like more information regarding online privacy risks, please contact the Minnesota State University, Mankato Information and Technology Services Help Desks (507-389-6654) and ask to speak to the Information Security Manager.

You are providing your informed consent to participate in this research by completing and submitting your responses to this online survey. Please print a copy of this page for future reference.

To access the survey please click the following
link: https://mnsu.co1.qualtrics.com/SE/?SID=SV_afJUYzqdYv10AsJ

Sincerely,

Beth Brisky

beth.brisky@mnsu.edu

MSU IRNet ID# 580816

Date of MSU IRB Approval: March 13, 2014

Appendix C



March 13, 2014

Dear Marlene Tappe, PhD:

Re: IRB Proposal entitled "[580816-2] Physical Environment and Women's Physical Activity Behaviors"
Review Level: Level [I]

Your IRB Proposal has been approved as of March 13, 2014. On behalf of the Minnesota State University, Mankato IRB, I wish you success with your study. Remember that you must seek approval for any changes in your study, its design, funding source, consent process, or any part of the study that may affect participants in the study. Should any of the participants in your study suffer a research-related injury or other harmful outcome, you are required to report them to the IRB as soon as possible.

When you complete your data collection or should you discontinue your study, you must notify the IRB. Please include your log number with any correspondence with the IRB.

This approval is considered final when the full IRB approves the monthly decisions and active log. The IRB reserves the right to review each study as part of its continuing review process. Continuing reviews are usually scheduled. However, under some conditions the IRB may choose not to announce a continuing review. If you have any questions, feel free to contact me at irb@mnsu.edu or 507-389-5102.

The Principal Investigator is responsible for maintaining signed consent forms in a secure location at MSU for 3 years. If the PI leaves MSU before the end of the 3-year timeline, he/she is responsible for following "Consent Form Maintenance" procedures posted online.

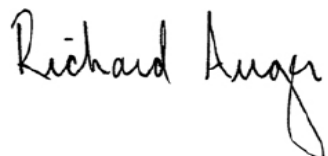
Cordially,

A handwritten signature in black ink that reads "Mary Hadley".

Mary Hadley, Ph.D.
IRB Coordinator

A handwritten signature in black ink that reads "Sarah Sifers".

Sarah Sifers, Ph.D.
IRB Co-Chair

A handwritten signature in black ink that reads "Richard Auger". The signature is written in a cursive style with a large, looping initial 'R' and a long, trailing flourish at the end of the name.

Richard Auger, Ph.D.
IRB Co-Chair

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within Minnesota State University, Mankato IRB's records.